AN ANALYSIS OF THE CALLING SONG OF *BURBUNGA MOULDSI* OLIVE (HEMIPTERA: CICADIDAE)

LINDSAY W. POPPLE

Biodiversity Assessment & Management, PO Box 1376, Cleveland, Qld 4163

Abstract

The calling song of *Burbunga mouldsi* Olive, 2012, a cicada from northeastern Queensland, is described and analysed for the first time. Comparisons are made between this species and the closely allied *Burbunga queenslandica* Moulds, 1994. The song of *B. mouldsi* is shown to be a sustained buzz that is nearly identical in structure to *B. queenslandica* and differs only in its higher dominant frequency.

Introduction

Cicada calling songs form a conspicuous feature of the Australian summer, their primary function being for mate attraction (Moulds 1990). The recognition of species specificity in these songs has led to their widespread use as a tool for species identification (Ewart 1988, 1998, Simões *et al.* 2000, Ewart and Popple 2001, Popple and Strange 2002, Ewart 2005, Quartau and Simões 2006, Seabra *et al.* 2006, Popple *et al.* 2008, Ewart 2009).

Burbunga mouldsi Olive is described in this issue (Olive 2012). Ewart (1988) provided the first description of the calling song of the related *B. queenslandica* Moulds [originally recorded as 'very similar to *Burbunga gilmorei* (Distant), but undescribed' and subsequently described as *B. queenslandica* by Moulds (1994)]. Ewart and Popple (2001) illustrated the calling song of *Macrotristria hillieri* (Distant, 1907), a species recently recognised as a close relative of the above taxa (Moulds in press). More recently, Ewart (2009) added further to the acoustic literature on this group with documentation of the calling song of *Burbunga venosa* Distant, 1907 [to be transferred to a new genus (Moulds in press)].

Here, I present an analysis of the calling song of *B. mouldsi* and provide a comparison with that of *B. queenslandica*, its closest known relative.

Materials and methods

Song analysis methodology and terminology follow Ewart and Marques (2008) and Popple *et al.* (2008). Calling songs were recorded in the field by the author using a Telinga Pro 6 parabolic microphone with a Marantz PMD670 Solid State Recorder at a 48 kHz sampling rate. Two song recordings of *B. mouldsi* were made, both on the 26.xii.2006, at Chewko Road via Mareeba (17.05°S, 145.37°E) and 10 km west of Mount Carbine (16.51°S, 145.04°E) respectively. A comparative recording of *B. queenslandica* was made on the 8.xii.2005 at Southwood National Park (27.81°S, 150.09°E). Songs were analysed using Cool Edit Pro version 2.0.

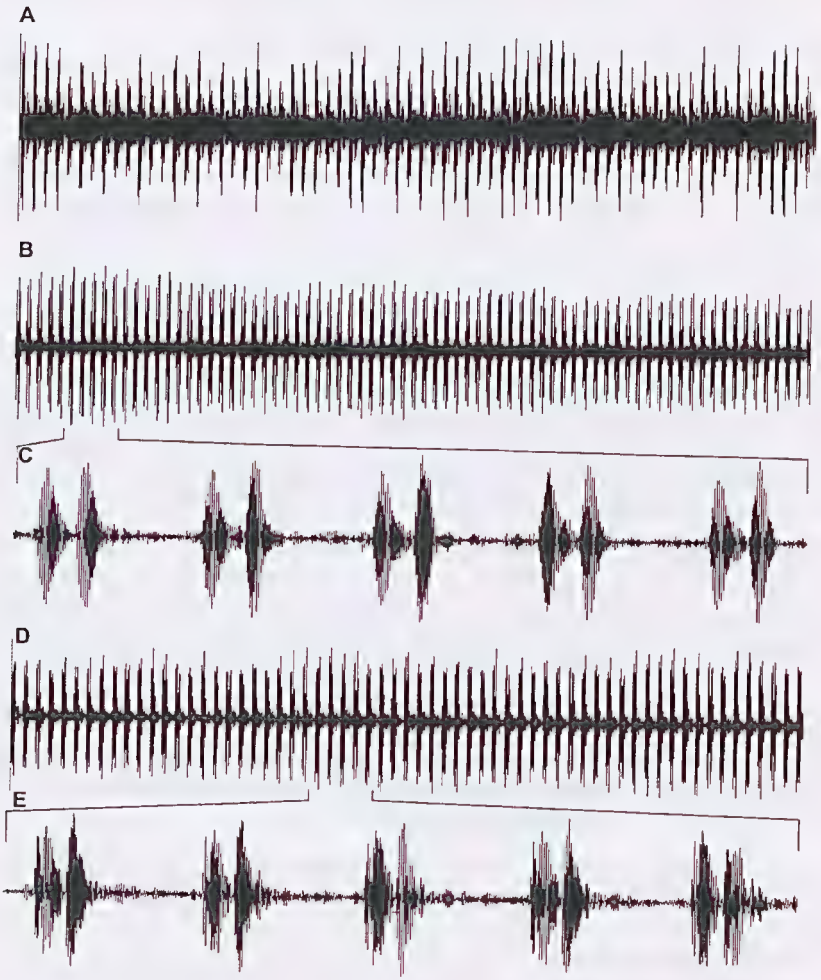

Fig. 1. Calling songs of *Burbunga mouldsi* (A-C) and *B. queenslandica* (D-E). Recorded at 10 km west of Mount Carbine (A) (filtered to 9 kHz), Chewko Road via Mareeba (B-C) (filtered to 9 kHz) and Southwood National Park (D-E) (filtered to 4 kHz). A, B and D: continuous buzzing song comprising evenly emitted trains of macrosyllables, each segment 0.5 seconds duration; C and E: time expanded details of five macrosyllables, each comprising a pulse doublet, both segments 0.035 seconds duration.

Results and discussion

Oscillographic plots of the calling songs of *B. mouldsi* and *B. queenslandica* are presented in Figure 1 and sonagrams are presented in Figure 2. Examination of the temporal song structure of these species revealed no apparent differences, with both species producing sustained bursts of regularly spaced pulse doublets (Fig. 1). However, differences were found to be readily evident in song pitch, with the dominant frequency of *B. mouldsi* calculated at approximately 11 kHz, compared with 9 kHz for *B. queenslandica* (Fig. 2).

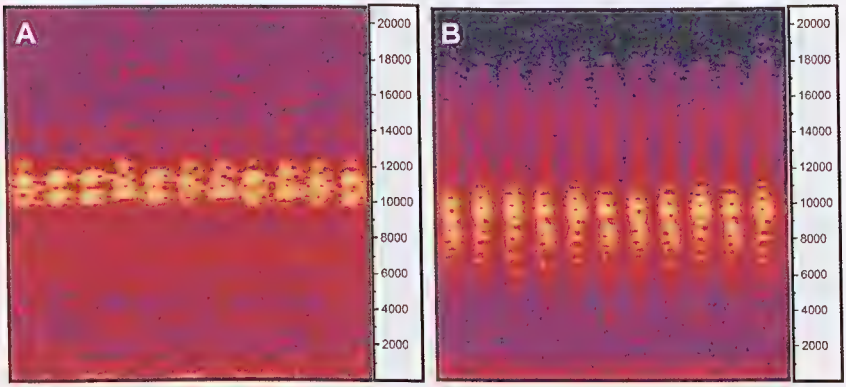

Fig. 2. Sonogram plots of the calling songs of *Burbunga mouldsi* (A) from 10 km west of Mount Carbine and *B. queenslandica* (B) from Southwood National Park. Song segments are approximately 0.075 seconds in duration.

The temporal structure of the calling songs of *B. mouldsi* and *B. queenslandica* are more rigid in pulse structure than the related *Macrotristria hillieri*, which produces a sustained burst comprised of single or occasionally double pulses (Ewart and Popple 2001). *Burbunga venosa* produces a slightly more intricate buzz with three to four pulses, each comprising triple syllables (Ewart 2009). This supports the placement of *B. venosa* into a sister genus. More broadly, the example here suggests that, in at least some instances, calling songs could be useful for grouping and distinguishing taxa above the species level.

Acknowledgements

The author wishes to thank Anne-Marie McKinnon and her father Michael McKinnon for assistance with obtaining the recordings in the field. Tony Ewart provided some useful advice and an anonymous referee provided some helpful suggestions, which improved the manuscript.

References

EWART, A. 1988. Cicadas (Homoptera). Pp 180-201, in: Scott, G. (ed.), *Lake Broadwater: the natural history of an inland lake and its environs*. Darling Downs Institute Press, Toowoomba.

EWART, A. 1998. Cicadas, and their songs of the Miles-Chinchilla region. *Queensland Naturalist* **36**(4-6): 54-72.

EWART, A. 2005. New genera and species of small ticking and 'chirping' cicadas (Hemiptera: Cicadidae) from Queensland, with descriptions of their songs. *Memoirs of the Queensland Museum* **51**(2): 439-500.

EWART, A. 2009. Cicadas of the eastern segment of the Cravens Peak Reserve, northeastern Simpson Desert, S.W. Queensland; January/February 2007. Pp 117-150, in: *Cravens Peak scientific study report*. Royal Geographical Society of Queensland, Geography Monograph Series, Volume 13.

EWART, A. and MARQUES, D. 2008. A new genus of grass cicadas (Hemiptera: Cicadoidea: Cicadidae) from Queensland, with descriptions of their songs. *Memoirs of the Queensland Museum* **52**(2): 139-192.

EWART, A. and POPPLE, L.W. 2001. Cicadas, and their songs, from south-western Queensland. *Queensland Naturalist* **39**(4-6): 52-71.

MOULDS, M.S. 1990. *Australian cicadas*. New South Wales University Press, Kensington; 217 pp.

MOULDS, M.S. 1994. The identity of *Burbunga gilmorei* (Distant) and *B. inornata* (Distant) (Hemiptera: Cicadidae) with descriptions of two allied new species. *Journal of the Australian Entomological Society* **33**(2): 97-103.

MOULDS, M.S. In press. A review of the genera of Australian cicadas (Hemiptera: Cicadidae). *Zootaxa*.

OLIVE, J.C. 2012. A new species of *Burbunga* Distant (Hemiptera: Cicadidae) from northeastern Queensland. *Australian Entomologist* **39**(2): 69-74.

POPPLE, L.W. and STRANGE, A.D. 2002. Cicadas, and their songs, from the Tara and Waroo Shires, southern central Queensland. *Queensland Naturalist* **40**(1-3): 15-30.

POPPLE, L.W., WALTER, G.H. and RAGHU, S. 2008. The structure of calling songs in the cicada *Pauropsalta annulata* Goding and Froggatt (Hemiptera: Cicadidae): evidence of diverging populations? *Evolutionary Ecology* **22**: 203-215.

QUARTAU, J.A. and SIMÕES, P.C. 2006. Acoustic evolutionary divergence in cicadas: the species of *Cicada* L. in southern Europe. Pp 227-237, in: Droupopoulos, S. and Claridge, M.F. (eds), *Insect sounds and communication: physiology, behaviour and evolution*. Taylor & Francis, London.

SEABRA, S.G., PINTO-JUMA, G. and QUARTAU, J.A. 2006. Calling songs of sympatric and allopatric populations of *Cicada barbara* and *C. orni* (Hemiptera: Cicadidae) on the Iberian Peninsula. *European Journal of Entomology* **103**: 843-852.

SIMÕES, P.C., BOULARD, M., REBELO, M.T., DROSOPOULOS, S., CLARIDGE, M.F., MORGAN, J.C. and QUARTAU, J.A. 2000. Differences in the male calling songs of two sibling species of *Cicada* (Hemiptera: Cicadoidea) in Greece. *European Journal of Entomology* **97**: 437-440.